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NOTES ON THE RESAMPLING OF CERTAIN FERTILIZED PLOTS

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NOTES ON THE RESAMPLING OF CERTAIN FERTILIZED PLOTS

In studies on the nutrient requirements of trees previously carried out here, several groups of plots variously fertilized were used. The results of these studies together with a full description of all the plots have been published in Black Rock Forest Bulletin Number 11. Four sets of the above plots were used in the present study. The areas in which they are located had all been thinned previous to fertilizing. This study was initiated to determine what changes if any occurred in soil nutrient concentrations after a period of 4-5 years following fertilizing, the results of the previous studies being used as the standard to gauge any change.

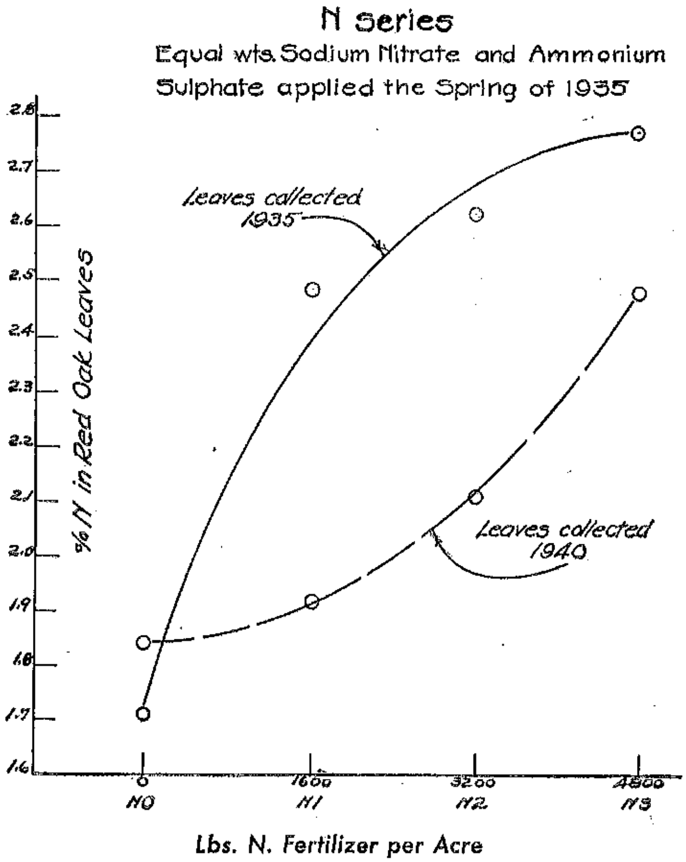

Fig. 1

Red oak leaves were used in the present study because this species occurred in sufficient numbers to permit adequate sampling on all the plots used. Leaf samples were taken from the plots on September 16-18, 1940, observing precautions outlined by Mitchell.[1] The leaf samples were air-dried, ground in a Wiley Mill, dried at 70° C and finally analyzed for either nitrogen, phosphorus or potassium by the micro-Kjeldahl, ammonium molybdate or cobalt methods respectively.

Figure 1 shows the results of chemical analysis of red oak leaves for total nitrogen in the fall of 1935 and 1940. Total nitrogen availability is lower for all the fertilized plots sampled in 1940. The control plot however, was significantly higher in 1940 than in 1935. Dried blood was used to fertilize the ON series of plots shown in Figure 2. All the plots in this series, together with the control plot, showed a higher total nitrogen availability in 1940 than they did in 1936. The Rock Phosphate Series of plots, Figure 3, were fertilized in the spring of 1934 with rock phosphate. All the fertilized plots in this series were lower in 1940 than in 1936. This is true of the control plot as well, but the difference in this case is not significant. The plots in the Potassium Series, shown in Figure 4, all had a higher potassium availability in 1940 than in 1935 although in the case of the K 3 plot, the difference is not significant.

The 1940 control plots (two nitrogen and one potassium) with the exception of the phosphorus control plot all showed a significant increase in internal leaf nutrient concentration. It has been shown that the internal leaf nutrient concentration is correlated with soil nutrient concentration. Hence it is very likely that the soil nutrient concentration on these control plots has increased. These plots had been thinned previous to the beginning

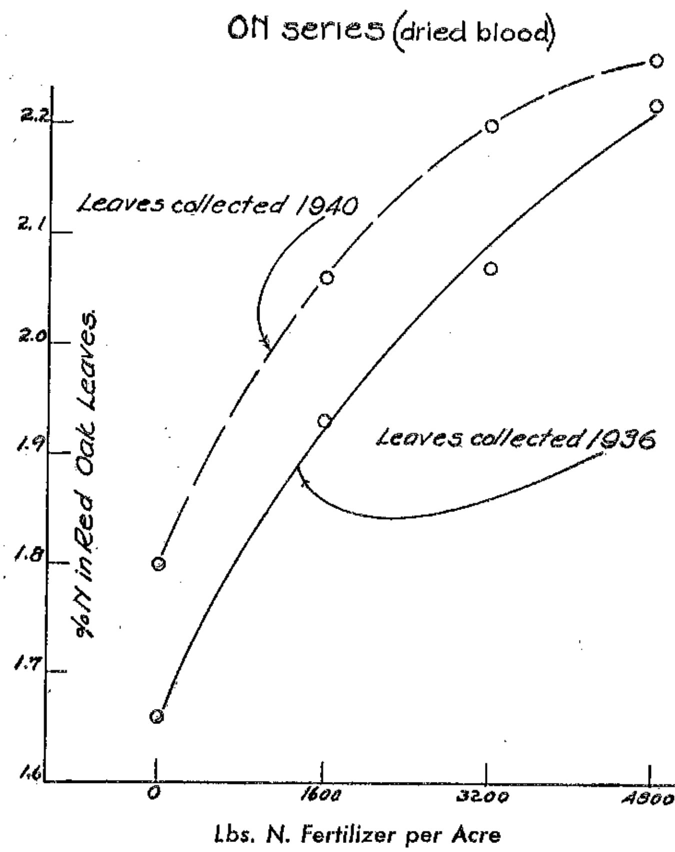

Fig. 2

[1] H. L. Mitchell, 1936—Trends in Nitrogen, Phosphorus, Potassium and Calcium Content of the Leaves of Some Forest Trees During the Growing Season. Black Rock Forest Paper 6:29-44.

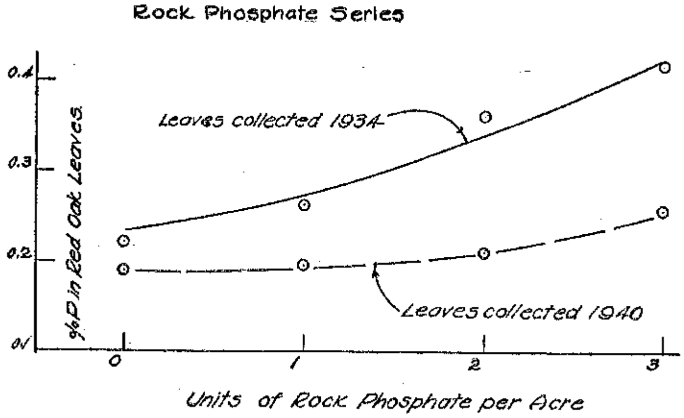

Fig. 3

of the experiments and subsequently the roots occupied a larger soil volume due to reduced root competition. The phosphorus control plot did not change significantly. This is interesting because Mitchell found these soils to be deficient in phosphorus. Plots fertilized with a mixture of equal weights of sodium nitrate and ammonium sulphate showed a significant decrease. However, plots fertilized with dried blood were higher in leaf nitrogen for 1940 than for 1936. In the case of the sodium nitrate-ammonium sulphate the solubility is given as 18% water-soluble nitrogen. Dried blood analyzed 12% total nitrogen but under the conditions of the experiment at that time (1935) only 31% of the total nitrogen was available. During the following years the decomposition of the dried blood probably provided a continuous stream of nitrogen. The effects of leaching were compensated for by this continuous supply. Also, as the leaves decomposed nitrogen was released to the trees. The total effect was to raise nitrogen availability which was reflected in the internal nitrogen content of the leaves which, it has been shown, is correlated with external supply. Figure 3 shows that P availability decreased by a significant amount in 1940. The increased percentage of phosphorus in the leaves with increased applications of phosphate in 1934 was due probably to the water-soluble phosphorus in the fertilizer. Since water-soluble compounds are subject to leaching it is reasonable to assume that some phosphorus was lost by this process while some was no doubt bound colloidally. These soils are deficient in available phosphorus. It has previously been shown that the Black Rock Forest soils are not deficient in available potassium. Fertilizing with potassium chloride produced little growth response. The 1940 potassium chloride curve (Figure 4) is somewhat higher than the curve for 1935 although the K 3 plot did not change very much. This stand had been thinned a short time previous to fertilizing. The expanding root system of the individual trees and the subsequent occupation by the roots of a larger soil volume could account for the increased absorption of potassium.

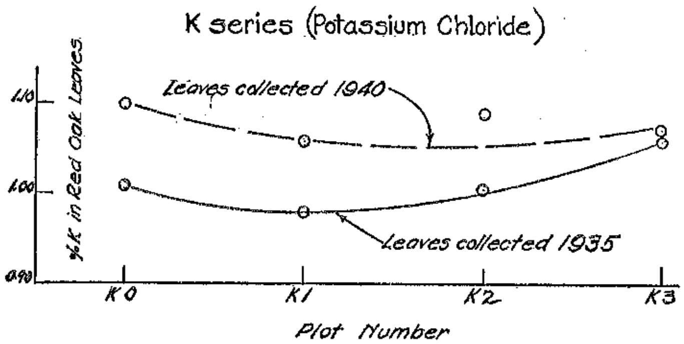

Fig. 4

Conclusions

(1) The plots fertilized with sodium nitrate-ammonium sulphate showed a significant decrease in available nitrogen.
(2) The plots fertilized with dried blood showed a significant increase in available nitrogen.
(3) The rock phosphate plots showed a significant decrease in available phosphorus. The control plot did not change significantly.
(4) Potassium availability increased on all this series of plots except on Plot K 3.
(5) Nitrogen availability can be increased by proper thinnings.